

**REMARKS**

Claims 1-50 are pending in the present application. Claims 21-50 stand withdraw from further consideration. Claims 7, 10, 19 and 20 are herein amended.

Claims 3 and 10 were objected to because the Examiner contends the phrase “said spin polarization electron” lacks antecedent basis.

Claim 3 is dependent upon claim 1 or 2. Claim 1 sets forth, on line 7, “a spin polarization electron is injected....” Thus, the phrase does have an antecedent basis.

Claim 10 has been amended to address the Examiner’s objection.

Claim 7 was objected to because the Examiner asserts that the phrase, “the first and the second magnetic layers” lacks antecedent basis. Claim 7 has been amended to address the Examiner’s objection.

Claims 19 and 20 were objected to because of a lack of antecedent basis. These claims have been amended to change the phrases to address the Examiner’s objection.

Claims 1-20 were rejected under 35 U.S.C. § 102(b) as being anticipated by *Inomata* (EP 1 085 586). Favorable reconsideration of this rejection is earnestly solicited.

Independent claim 1 requires in part:

a spin injection device characterized in that it comprises  
a spin injection part having a spin polarizing part and an injection junction part,  
and SyAF having a first magnetic layer and a second magnetic layer **having different magnitudes of magnetization**, and magnetically coupled together  
antiparallel to each other via a nonmagnetic layer.... Emphasis added.

The Examiner contends the above stated required elements of claim 1 are disclosed in the *Inomata* reference, specifically by figure 10 and paragraphs 59 and 64. However, *Inomata* does not appear to teach, “having different magnitudes of magnetization.”

Page 18, paragraph 47 of the **present** specification states:

[0047] As shown in Fig. 1(b), in SyAF 3 of the present invention, the spins of the first and the second magnetic layers 4 and 6 are magnetically coupled while maintained in antiparallel state. *That is, the magnetizations of the first and the second magnetic layers 4 and 6 are those in antiparallel state of different sizes, in other words, they have antiparallel spins of different sizes.* Assuming the thickness of the first magnetic layer 4 as  $t_1$ , the magnetization as  $M_1$ , the thickness of the second magnetic layer 6 as  $t_2$ , *the magnetization as  $M_2$ , the direction of the larger magnetization ( $t_1M_1 - t_2M_2$ ) can be the direction of the spin of SyAF ↑ or ↓ with regard to the arrow indicating the spin of a ferromagnetic layer 9 in Fig. 1.* In order to make difference in the magnitude of antiparallel magnetizations of the magnetic layers 4 and 6 of SyAF 3,  $t_1M_1$  and  $t_2M_2$  may be made different. Emphasis added.

As is illustrated from the above mentioned passage and independent claim 1, the magnitudes of the magnetic layers 4 and 6 are of different sizes. This is also shown by the different sizes of the arrows in the figures, i.e. figure 1.

Specifically, as shown in figure 10 of *Inomata*, the size of the arrows appears to be exactly the same. This tends to show that the **magnitude** of the magnetic layers is the **same**.<sup>1</sup> Furthermore, there does not appear to be any evidence in *Inomata* that the magnitude of the different magnetic layers 105(a) and 105(c) is different from one another.

In addition to the differences of SyAF, the structure concerning a spin injection device differs as shown by Fig. 1. The features and the effect of the claimed invention are described in paragraphs [0039] to [0050], examples 1 to 3, and Figs. 1, 18 and 19 of the present specification. For example, the structure of the spin injection device has been described in paragraph [0039]. The effect of claimed invention has been also described in [0050].

Paragraph [0106] clarifies the different effects between the claimed invention and *Inomata*. That is to say, the magnetoresistive element of *Inomata* needs to apply an external magnetic field to change the magnetization direction of free ferromagnetic layer thereby to change its magnetoresistance.

On the other hand, the claimed invention relates to a device to reverse the magnetization of SyAF layer by the direction of electric current flowing to the spin injection device itself. Thereby, the resistance of the spin injection device is changed by the direction of current flow. Therefore, the device of the present invention does not require an external magnetic field to be applied.

As is seen here, the mechanisms between the spin injection magnetization reversal used in the spin injection device of claim 1, and the magnetization reversal by external magnetic field of the magnetoresistive element having a ferromagnetic double tunnel junction device in *Inomata* differ entirely.

Independent claim 7 requires in part:

a spin injection magnetic apparatus characterized in that it comprises a free layer having the first and the second magnetic layers coupled together magnetically antiparallel the each other via a nonmagnetic layer, and **in which magnitudes of magnetization are different....**

As discussed earlier regarding independent claim 1, the different magnitudes of magnetization does not appear to be disclosed by *Inomata*. For the reasons mentioned earlier, the Examiner's rejection of claim 7 appears to be inappropriate.

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<sup>1</sup> It is noted that the magnitude of the magnetization is independent from the direction of the magnetization.

The mechanism and effect of the invention of claim 1 also apply to claim 15.

Independent claim 15 requires in part:

a spin injection device comprising a spin injection part having a spin polarization part including a ferromagnetic fixed layer and an injection junction part of a nonmagnetic layer, and including a ferromagnetic fixed layer and an injection junction part of a nonmagnetic layer, and a ferromagnetic free layer provided in contact with said spin injection part, wherein ... a nonmagnetic layer is provided on the surface of said ferromagnetic free layer....

The Examiner contends these features are disclosed in *Inomata* in figure 10. Specifically, the Examiner contends that the injection junction part is disclosed by element 104. Reference character 104 is described as a “first dielectric layer.” See paragraph 63.

The Examiner contends that the “ferromagnetic free layer” as required by claim 15 is disclosed by reference character 105 of *Inomata*. However, layer 105 appears to consist of 3 separate layers, a first magnetic layer 105(a), a second magnetic layer 105(c) and a third non-magnetic layer 105(b). Note that according to the Examiner’s interpretation of *Inomata*, layer 105(a) appears to be the only layer in contact with the “spin injection part.”

According to paragraph 63 of *Inomata*, the first magnetic layer 105(a) is a “ferromagnetic layer.” Thus, the Examiner’s rejection of claim 15 appears to be inappropriate as claim 15 specifically requires “*a ferromagnetic free layer provided in contact with said spin injection part.*” Emphasis added.

Please see Figs. 4 and 5 of the present application and paragraphs [0052] to [0056] in which the structure, mechanisms and effect are explained.

Independent claim 17 requires "a ferromagnetic free layer provided in contact with said spin injection part." See paragraphs [0057] to [0064] in which the structure and effect are explained with reference to Figs. 6 to 8. The mechanism and effect described above also apply to claim 17.

**Conclusion**

In view of the aforementioned amendments and accompanying remarks, Applicants submit that the claims, as herein amended, are in condition for allowance. Applicants request such action at an early date.

If the Examiner believes that this application is not now in condition for allowance, the Examiner is requested to contact Applicants' undersigned attorney to arrange for an interview to expedite the disposition of this case.

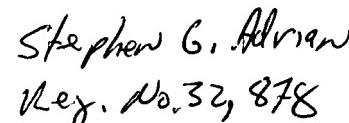
If this paper is not timely filed, Applicants respectfully petition for an appropriate extension of time. The fees for such an extension or any other fees that may be due with respect to this paper may be charged to Deposit Account No. 50-2866.

Respectfully submitted,

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